

New Scientist

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A NEW WAY TO THINK ABOUT THE ORIGINS OF LIFE

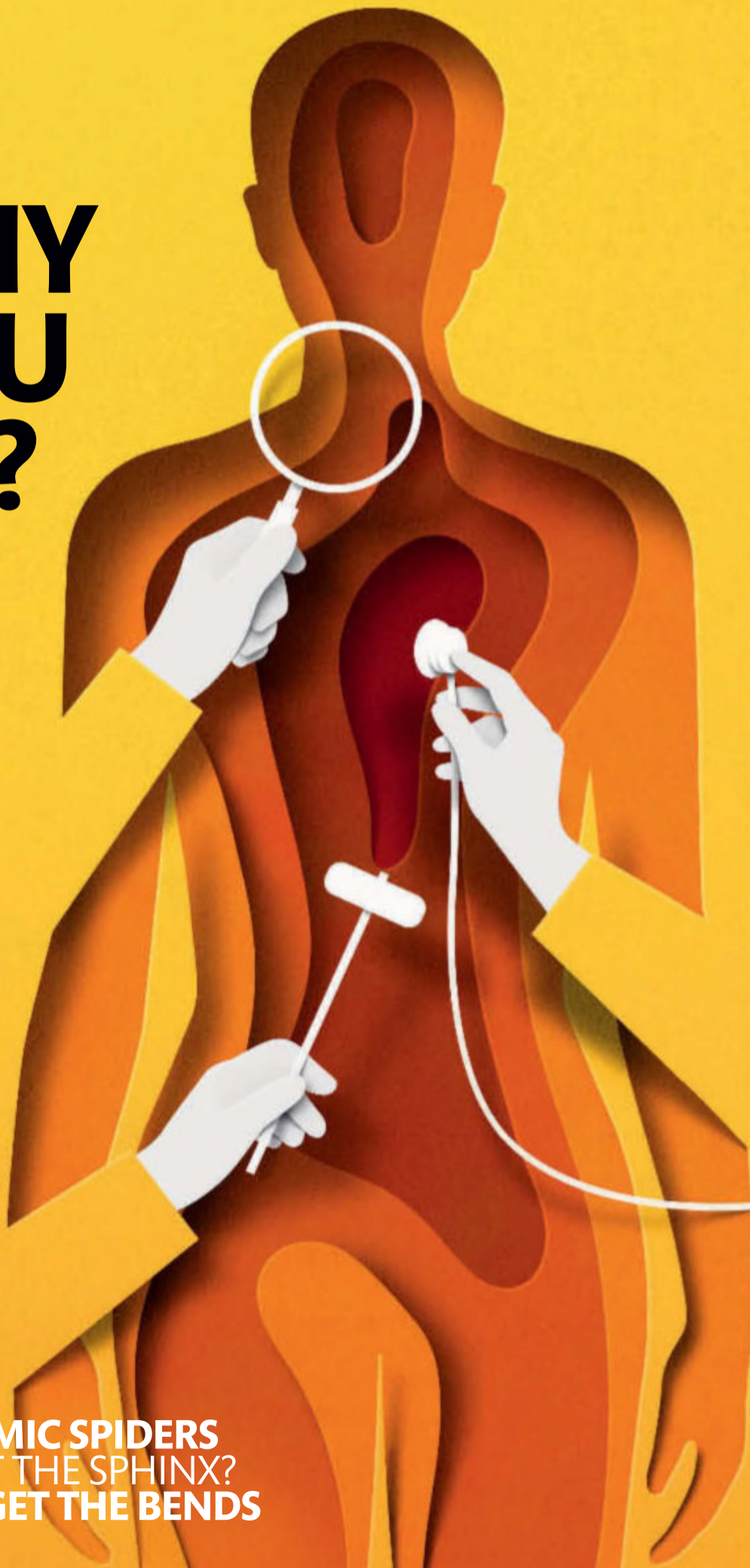
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Martian gamble

NASA's Mars Sample Return mission aims to find life, but a rethink is needed to ensure Earth's biosecurity, says **Paul Marks**

IN THE past few months, the wheels started to fall off NASA's Mars Sample Return (MSR) mission. The project aims to bring 500 grams of Martian rock and soil to Earth in 2033 to look for signs of existing or extinct life forms, but a litany of budget overruns and technology blunders have put its viability in doubt.

Not that MSR needs such problems to arouse controversy, as it is a troublesome concept all round. The reason why? There is a non-zero risk that it could deliver to Earth extraterrestrial organisms that microbiologists simply don't understand or know how to combat, nor even contain. And, if they are pathogenic, there is a risk that spilling them in a break-up of a re-entry vehicle, or a leak from a lab, could lead to ecosystem collapse or a contagion – not ideal after covid-19, which cost the US alone \$14 trillion.

So, to comply with the UN's Outer Space Treaty, which outlaws "back contamination" of Earth by returning spacecraft, NASA has been engineering this complex \$5.3 billion mission to avert such a "low-probability, yet high-consequence" outcome. In July, however, its ballooning costs provoked the US Senate to threaten cancellation. Its projected spend has now doubled: in September, a NASA report criticised the mission's "unrealistic budget and schedule expectations", estimating the true cost as nearer \$11 billion.

It got worse: among the report's



findings, it identified serious risks with a crucial back-contamination prevention technology. Once a lander retrieves sample tubes cached by the Perseverance rover, it will place them in a sealed container which a rocket will launch into Mars orbit. But the container's exterior, tainted with Martian dust, must be sterilised once captured by the mission's Earth Return Orbiter. However, the report found that a thermal sterilisation system had been swapped, with no "compelling explanation", for an ultraviolet-based system whose ability to kill microorganisms was unproven

and so not qualified for use on the mission. The report ordered government agency and independent tests on that critical UV system's efficacy.

Elsewhere, the US Fish and Wildlife Service (USFWS) has, since June, been studying a complaint from the International Committee Against Mars Sample Return (ICAMSR) about the risk to Earth's ecosystems if an invasive alien pathogen escapes from an MSR spacecraft or lab. At the time of going to press, the USFWS says it is still reviewing ICAMSR's complaint "for appropriate action". The complaint cites a report published

in the journal *BioScience* that noted that the Committee on Space Research (COSPAR), which helped NASA draw up the mission's anti-contamination protocols, hasn't consulted invasive species biologists.

COSPAR was also reproached in a blistering critique of the mission's risks published in October by the Bulletin of the Atomic Scientists – best known for the Doomsday Clock. MSR planners should consider findings on survivability under Mars-like conditions, the article says, as well as the adaptability of microbes to mutate and survive other extreme conditions – factors, it says, that are ignored in out-of-date, COSPAR-inspired procedures.

NASA is now being urged to press ahead with a cheaper MSR mission to obtain Mars samples before China does. But a bruised geopolitical ego cannot be allowed to risk Earth's biosecurity.

What is clearly needed to safely check for the presence of life on Mars, says ICAMSR, is to cancel the mission and send rovers with far more advanced life-detecting instruments to the Red Planet instead. They are right. Earth has one biosphere – and to risk it all just to assuage the curiosity of a handful of space scientists is a risk too far. ■



Paul Marks is a technology, aviation and space-flight journalist based in London